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A Menu-Driven Graphical Analysis System
For Examining Aerodynamic Data

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Introduction

Graphical analysis techniques are beneficial for examining the results of the experimental and computational methods of aerodynamics. The primary reason for developing graphical analysis tools is to increase the productivity of researchers who are attempting to gain physical insight from large quantities of data. The problem with many graphical analysis systems, however, is that they are too difficult to use effectively, unless the user is willing to devote a large amount of time learning to use the tool. In addition, many graphical analysis systems suffer from lack of portability due to the use of non-standard graphics languages. The purpose of this project was to develop a user-friendly, menu-driven interface which would unite a number of color graphics tools used for examination of aerodynamic data, into a complete graphical analysis system, based on the X-Windows graphics/windowing standard.

Description of Work Completed

Under a previous cooperative agreement with the Langley Research Center (NCC1-132), a menu-driven graphical analysis system (called FLOWVU) was developed for examining 2-D "grid type" data sets. The system is based on the X-Windows graphics/windowing standard, and is capable of handling both structured and unstructured grid types. The system has its foundation on a number of graphics routines developed by Dr. Robert P. Weston of the Computational Aerodynamics Branch at the NASA Langley Research Center.

FLOWVU was originally designed as a color computer graphics package allowing one to display contour (both line and solid-shaded) and vector plots for 2-D structured and unstructured "grid-type" data sets. One of the major problems with the original version of FLOWVU was its lack of quantitative analysis features. Under the current cooperative agreement, several quantitative analysis features have been added, including a Dynamic Probe, which allows one to insert a probe into a solution domain (displayed as a contour plot on the computer screen) and dynamically determine the values of specific solution variables at the probe location, and a XY-Plot feature, which allows one to position a line within the solution domain and have solution variables plotted as a function along the distance of the line.

In addition to these new quantitative analysis features, several other features have been added to the code which allow one to obtain presentation quality hardcopies of color graphics images on the screen. With the newly developed version of FLOWVU one can obtain both PostScript image files and Graftel Standard Format image files. PostScript is an ascii graphics description language which can be used to create a device independent description of a graphics image. Since PostScript is supported by nearly every major laser printer manufacturer, PostScript image files created with FLOWVU offer a convenient means of obtaining high-quality presentation hardcopy. The Graftel Standard Format is a graphics image format used by many Tektronix color laser printers, for obtaining high-quality color graphics images.

Another problem with the original version of FLOWVU, was its lack of portability to other computer vendor's machines. This problem arose due to the inability of finding a standard X-Toolkit with sufficient capability for creating a menu-driven graphical analysis system. The original version of FLOWVU used the DECwindows Toolkit, which is the toolkit provided with all Digital Equipment Corporation machines. As such, the original version of FLOWVU was operational only on DEC machines.

Much of the current work has focused on making FLOWVU a truly device independent color graphics package. A new version of the code has been developed using the X Toolkit. The X Toolkit is a public domain toolkit distributed freely by the Massachusetts Institute of Technology. The new version of FLOWVU has been coded and tested successfully on a variety of DEC machines including the VAXstation 3100 and 3200, the DECstation 2100, 3100, and 5000, as well as on a number of Sun workstations, including the Sun 3/60 and the Sparcstation.